Claims

1. A fuel cell comprising:

an anode substrate and a cathode substrate and a proton exchange membrane disposed between said substrates;

an anode flow field plate providing a fuel reactant gas flow field adjacent said anode substrate;

a cathode flow field plate providing an oxidant reactant gas flow field adjacent said cathode substrate;

said fuel reactant gas flow field receiving fuel from a fuel reactant gas inlet manifold and exhausting into a fuel reactant gas exhaust manifold;

said oxidant reactant gas flow field receiving oxidant from an oxidant reactant gas inlet manifold and exhausting into an oxidant reactant gas exhaust manifold; and

at least one of said flow field plates associated with a water flow field, said water flow field being dead ended in the region of the corresponding one of said reactant gas inlet manifolds and opening into the corresponding one of said reactant gas exit manifolds.

2. A fuel cell stack comprising:

a plurality of fuel cells according to claim 1;

and a gas impervious separator plate separating each of said fuel cells from adjacent ones of said fuel cells, said separator plate selected from (a) a cooling plate having a coolant flow field therein and (b) a solid plate.

3. A fuel cell according to claim 1 wherein:

said flow restrictor maintains the pressure of reactant gas between 0.2 and 2.0 psi above the pressure in the corresponding exit manifold.

4. A fuel cell stack comprising:

a plurality of fuel cells according to claim 1;

a plurality of cooling plates, each having a coolant flow field therein, each of said fuel cells being separated from a fuel cell adjacent thereto by one of said cooling plates, a portion of each of said coolant flow fields coaligned with a portion of at least one of said reactant flow fields in the vicinity of said reactant gas inlet manifold, there being at least one weep hole between said portion of said coolant flow field and each of said reactant gas flow fields.

5. A fuel cell stack according to claim 4 wherein:

the pressure of coolant is lower than reactant gas inlet pressure and higher than pressure in the corresponding reactant gas exit manifold.

6. A fuel cell according to claim 1 wherein:

said flow restrictor comprises interdigitated reactant gas flow field channels.

7. A fuel cell according to claim 1 wherein:

at least one of said flow field plates is porous.

8. A fuel cell according to claim 7 wherein:

said porous substrate is selected from (a) a hydrophilic substrate, (b) a wetproofed substrate, and (c) a substrate which is partially hydrophilic and partially wetproofed.

9. A fuel cell according to claim 1 wherein:

at least one of said flow field plates is solid with reactant gas flow channels and small holes extending from said channels into said water flow field.

10. A fuel cell according to claim 9 wherein:

said small holes are filled with a particulate material thereby forming a porous plug.

11. A fuel cell according to claim 1 wherein:

at least one said flow field plate has a flow restrictor at the exhaust end thereof to maintain the pressure of reactant gas in said one flow field above the pressure of reactant gas in said corresponding one of said reactant gas exit manifolds.